

**Remarks:**

The above amendments and these remarks are responsive to the non-final Office action dated August 30, 2006, and are being filed under 37 C.F.R. § 1.111. Claims 1-40 are pending in the application, with claims 29-38 and 40 being withdrawn from consideration. In the Office action, the Examiner (1) objected to the drawings for failing to comply with 37 C.F.R. § 1.84(p)(5), (2) noted an informality in the specification relating to a trademark, (3) objected to claim 27 for including an informality, (4) rejected claim 24 under 35 U.S.C. § 112, second paragraph, as being indefinite, and (5) rejected each of the (non-withdrawn) pending claims under 35 U.S.C. § 102 or § 103 as being anticipated by or obvious over one or more references. Applicants traverse the rejections, contending that all of the pending claims are patentable over the cited references.

Nevertheless, to expedite the issuance of a patent, and to more particularly point out and distinctly claim the subject matter that applicants regard as the invention, applicants have (1) amended claims 1, 12, and 17, and (2) canceled every withdrawn claim (claims 29-38 and 40) and claims 10, 13, 21-28, and 39, without prejudice. However, applicants reserve the right to pursue the subject matter of any of the canceled claims and original claims 1, 12, and 17 at a later time. Furthermore, applicants have presented remarks showing that all of the pending claims are patentable over the cited references. In view of the amendments above, and the remarks below, applicants respectfully request reconsideration of the application under 37 C.F.R. § 1.111 and prompt allowance of all of the pending claims.

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**I. Objection to the Drawings**

The Examiner objected to the drawings for failing to comply with 37 C.F.R. § 1.84(p)(5). In particular, the Examiner stated that the drawings are objected to because they do not include reference number "186e," which is found in the specification on page 11, line 29. However, reference number "186e" was introduced into the specification through a typographical error. Applicants have amended the specification to replace "186e" with "186d," which is shown in Figures 5, 6, and 8 of the application. Accordingly, it is submitted that the objection to the drawings should be removed.

**II. Specification - Informality**

The Examiner noted an informality in the specification related to the use of a trademark. In response, applicants have amended the specification to correct the informality.

**III. Claim Objection**

The Examiner objected to claim 27 due to an informality. In particular, the Examiner noted that the phrase "to so" should be replaced by "so." Applicants thank the Examiner for pointing out this typographical error. However, applicants have canceled claim 27.

**IV. Claim Rejections - 35 U.S.C. § 112**

The Examiner rejected claim 24 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for use of the term "at least substantially." Applicants traverse

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the rejection, contending that claim 24 is definite as written. However, applicants have canceled claim 24, rendering the rejection moot.

**V. Claim Rejections - 35 U.S.C. §§ 102 and 103**

In the Office action, the Examiner rejected each of the (non-withdrawn) pending claims as being anticipated or obvious. Claims 1, 4-9, 11-17, 19, 20, and 39 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,808,075 to Böhm et al. ("Böhm"). The remaining claims were rejected under 35 U.S.C. § 103(a): claims 2, 3, 18, 21, 22, and 24-28 were rejected as being unpatentable over Böhm in view of U.S. Patent No. 6,838,056 to Foster ("Foster"); claim 10 was rejected as being unpatentable over Böhm in view of U.S. Patent No. 4,216,477 to Matsuda et al. ("Matsuda"); and claim 23 was rejected as being unpatentable over Böhm in view of Foster and further in view of "A Microfabricated Fluorescence-activated Cell Sorter" by Fu et al. Applicants traverse the rejections, contending that each of the pending claims is patentable over the cited references. Nevertheless, for the reasons set forth herein, applicants have amended independent claims 1, 12, and 17, and has canceled independent claims 21 and 40 and dependent claims 10, 13, and 22-28, without prejudice. Each of the pending claims is patentable at least for the reasons set forth below.

**A. Claims 1-9 and 11**

Independent claim 1, as amended, is directed to a device for sorting particles:

1. (Currently Amended) A device for sorting particles, comprising:  
a channel structure defining a channel having an inlet and first and second outlets;

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a first transport mechanism configured to create a particle stream of first particles and one or more second particles, each particle traveling along the channel from the inlet toward the first outlet and disposed in a fluid supported by the channel structure; and

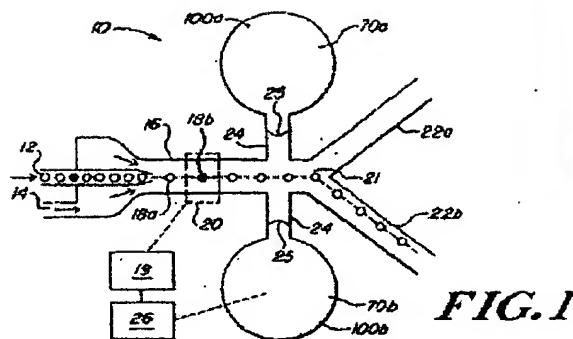
a second transport mechanism configured to be pulse-activated to selectively move at least one of the second particles from the particle stream and toward the second outlet,

**wherein the channel structure defines a passage disposed in fluid communication with the channel and generally opposing the second outlet, and wherein the passage includes a fluid diode configured to restrict fluid backflow created by operation of the second transport mechanism.**

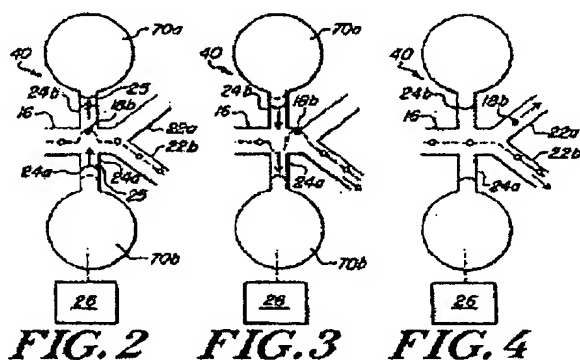
Claim 1 has been amended to correspond to dependent claim 10, and claim 10 has been canceled, without prejudice. In the Office action, claim 10 was rejected as being unpatentable over a combination of Böhm and Matsuda. However, there is no teaching, suggestion, or motivation to combine the references, or the reference teachings.

Böhm relates to a method and apparatus for sorting particles. Figure 1 of Böhm, which is reproduced here to facilitate review, illustrates an exemplary particle sorting system 10. A stream of particles is introduced by a first supply duct 12. The particles enter a measurement duct 16, which extends to a branch point 21 and first and second branches 22a, 22b. The particles are detected by a detector 19 as the particles flow through a measurement region 20. Bubble valves 100a, 100b are positioned in communication with the measurement duct via side passages 24. An actuator 26 is operatively coupled to bubble valve 100b, to impose a pressure differential between the bubble valves.

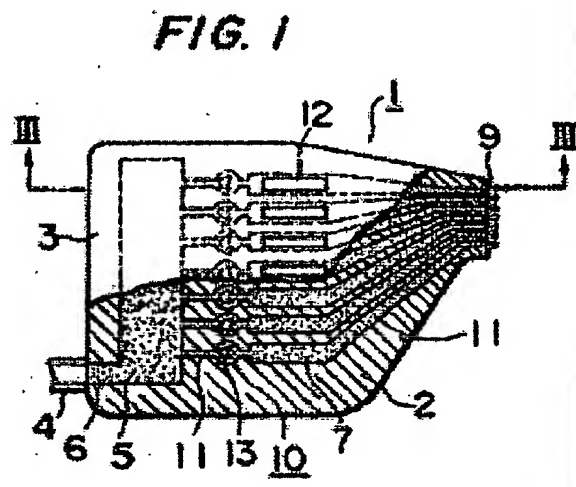
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Figures 2-4 illustrate use of system 10 to direct particles to branches 22a and 22b. These figures are reproduced here to facilitate review. Figure 2 illustrates deflection of a particle 18b by forward transverse flow, indicated by upward arrows toward reservoir 70a. The transverse flow is created by operation of actuator 26 to pressurize reservoir 70b. Figure 3 illustrates reverse transverse flow, indicated by downward arrows toward reservoir 70b, that is created when the actuator is deactivated. Figure 4 illustrates the bubble valves after equilibrium has been re-established and particle 18b has been directed to branch 22a.



Matsuda relates to a nozzle head of an inkjet printing apparatus having built-in fluid diodes. Figure 1 of Matsuda, which is reproduced here to facilitate review, illustrates an exemplary nozzle head with fluid diodes. The nozzle head has an ink reservoir 5 connected via flow paths 11 and pump chambers 7 to a plurality of nozzle holes 9 for ejecting ink particles. A fluid diode 10 for restricting reverse fluid flow is disposed between each flow path 11 and pump chamber 7.



It would not have been obvious to combine Böhm with Matsuda because there is no teaching, suggestion, or motivation to make this combination. In particular, as described above in relation to Figures 2-4, Böhm discloses a sorting system that relies on transverse fluid flow in opposing directions (e.g., upward and downward in Figures 2-4 of Böhm) to create transient deflection of particles to branch 22a. Introduction of the fluid diode of Matsuda into the system of Böhm would have been expected to disrupt operation of the sorting system, because fluid would be restricted from flowing in

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opposing directions. Accordingly, it would not have been obvious to modify Böhm to include "a fluid diode configured to restrict fluid backflow created by operation of the second transport mechanism," as recited by claim 1.

In summary, it would not have been obvious to combine Böhm with Matsuda to achieve the invention of independent claim 1. Claim 1 thus should be allowed. In addition, claims 2-9 and 11, which ultimately depend from claim 1, also should be allowed for at least the same reasons as claim 1.

**B. Claims 12 and 14-16**

Independent claim 12, as amended, is directed to a device for sorting particles:

12. (Currently Amended) A device for sorting particles, comprising:

a channel structure defining a channel having an inlet and first and second outlets;

a first transport mechanism configured to move first particles and one or more second particles in the channel from the inlet toward the first outlet, the first particles and one or more second particles being disposed in a fluid; and

a second transport mechanism configured to apply a transient pressure pulse on the fluid so that at least one of the second particles is selectively moved toward the second outlet,

**wherein the second transport mechanism includes a thin-film heater element, a thin-film piezoelectric element, or both.**

Claim 12 has been amended to correspond generally to dependent claim 13, and claim 13 has been canceled, without prejudice. In the Office action, claim 13 was rejected as being anticipated by Böhm. However, amended claim 12 differs from claim 13 in reciting "a thin-film heater element, a thin-film piezoelectric element, or both." Neither Böhm nor any of the other cited references, taken alone or in combination, teaches or suggests a thin-film heater element or a thin-film piezoelectric element.

Böhm discloses a sorting system with a pressure wave generator. The pressure wave generator is disclosed to be a piezoelectric column or a heat pulse generator, among others. However, none of the pressure wave generators are disclosed to be thin-film devices. In the Office action, the Examiner apparently agreed with this assertion by indicating that Böhm does not disclose "wherein the second transport mechanism is included in the thin-film electrical devices."

The Examiner relied on the disclosure of Foster to reject other claims involving thin-film electrical devices. However, neither Foster nor any of the other cited references discloses a thin-film heater element or a thin-film piezoelectric element.

In summary, none of the cited references, taken alone or in combination, teaches or suggests every element of amended independent claim 12. Claim 12 thus should be allowed. In addition, claims 14-16, which ultimately depend from claim 12, also should be allowed for at least the same reasons as claim 12.

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C. Claims 17-20

Independent claim 17, as amended, is directed to a device for sorting particles:

17. (Currently Amended) A device for sorting particles, comprising:

a channel structure defining first and second channels ~~in fluid communication~~ that extend adjacent one another and between respective pairs of opposing ends of the first and second channels, the channel structure further defining a transverse channel that connects the first channel to the second channel intermediate the pair of opposing ends of each channel;

a first transport mechanism configured to send respective first and second streams through the first and second channels, the first stream including first particles and one or more second particles; and

a second transport mechanism configured to selectively move at least one of the second particles from the first stream to the second stream via the transverse channel.

In the Office action, claim 17 was rejected as being anticipated by Böhm. However, claim 17 has been amended. Support for the amendments to claim 17 are included in the application as filed, for example, in Figures 2 and 6 and the corresponding descriptive text. Neither Böhm nor any of the other cited references, taken alone or in combination, teaches or suggests every element of amended claim 17. For example, none of the cited references teaches or suggests the recited combination of a channel structure and transport mechanisms for moving particles within the channel structure. Claim 17 thus should be allowed. Claims 18-20, which depend from claim 17, also should be allowed for at least the same reasons as claim 17.

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**VI. Conclusion**

Applicants submit that this application is now in condition for allowance, in view of the above amendments and remarks. Accordingly, applicants respectfully request that the Examiner issue a Notice of Allowability covering all of the pending claims. If the Examiner has any questions, or if a telephone interview would in any way advance prosecution of the application, please contact the undersigned attorney of record.

Respectfully submitted,

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**CERTIFICATE OF FACSIMILE TRANSMISSION**

I hereby certify that this correspondence is being facsimile transmitted to Examiner M. Hageman, Group Art Unit 3653, Assistant Commissioner for Patents, at facsimile number (571) 273-8300 on November 24, 2006.



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